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ABSTRACT

This unit, developed by the Third World Science Project, is designed to add a multicultural element to existing science syllabi (for students aged 11-16) in the United Kingdom. The project seeks to develop an appreciation of the: boundless fascination of the natural world; knowledge, skills, and expertise possessed by men/women everywhere; application of knowledge and skills to solve the practical problems of everyday life; impact of modern technology in the world; and the influence of the cultural background on the perception of knowledge, problems, and solutions. The unit begins with a brief consideration of the importance of salt in the diet and extraction of salt from mines/seawater. Additional topic areas considered include: salt produced from swamps at Nala (Tanzania), focusing on ingenuity of villagers in providing a living without money to buy commercial table salt; salt extraction from plants (including papyrus) by burning dried leaves; Cibwa salt production in Northern Zambia (presented as a student science project); salt production in the highlands of Papua New Guinea; use of wood to absorb salt from dilute solutions; and salt production in the Turks/Caicos islands; and procedures used to obtain salt from sea water at salt works located near Guerande in Brittany. (JN)

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SALT

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THIRD WORLD SCIENCE

Third World Science seeks to develop an appreciation of:

1 The boundless fascination of the natural world

2 The knowledge, skills and expertise possessed by men and women everywhere

3 The application of knowledge, skills and expertise to solve the practical problems of everyday life

4 The impact of modern technology in the third world

5 The influence of the cultural background on the perception of knowledge, problems and solutions

The following Units have been designed to fit into existing science syllabuses in the United Kingdom:

CARRYING LOADS ON HEADS: CHARCOAL: CLAY POTS:
DENTAL CARE: DISTILLATION: ENERGY CONVERTORS:
FERMENTATION: HOUSING: IRON SMELTING: METHANE DIGESTORS:
NATURAL DYES: PLANTS AND MEDICINES: SALT: SOAP.

The method of use is not closely prescribed. As resources teachers may use them in different ways though suggestions are offered. Feedback is invited from teachers concerning (a) the use made of the material (b) pupils reactions, if possible in their own words, and (c) suggestions for improvements, additions etc.

Please send feedback, ideas and requests to:

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SALT

Teacher's Notes

Everyone needs salt in their diet, and around the world different people have discovered various ways of providing salt to meet their daily needs.

The unit begins with a brief consideration of the importance of salt in our diet and the extraction of salt from mines and seawater. This is followed by an account of village production of salt from swamps at Nala, Tanzania, by Mr. D.R. Morgan, who spent four years as an education officer with the Government of Tanzania on a contract sponsored by the Ministry of Overseas Development. It is intended that this account should demonstrate the ingenuity of these people to provide a living and to stay alive even though they have no money to buy commercial table salt, rather than the primitive methods used to obtain salt by scraping around for it in the mud.

The next section describes the extraction of salt from plants e.g. Papyrus etc, by burning dried leaves and obtaining salt from the ash produced. This is followed by an account of how Cibwa salt is made in Northern Zambia - the work was presented as a Science project by two Third year pupils at Lubushi Seminary.

The various methods of making salt in the Highlands of Papua New Guinea were submitted by the pupils of a volunteer teacher, Mr. David Eveleigh, and illustrate the use of wood to absorb salt from dilute solutions. This is followed with some translated extracts from 'Old Craft', an African school text book.

The section on 'salt production in the Turks and Caicos islands' includes work submitted by a pupil from there. The unit concludes with the sea-salt production in France, the information being obtained from a visitors guide of the salt works near Guerande in Brittany.

SALT

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SALT IN OUR DIET

In every country in the world the main meal of the day will surely have common salt added to it. A balanced diet normally contains adequate amounts of salt, as a certain quantity is added during the preparation and cooking of food. It would appear therefore, that enough salt enters the body in this way without having to add it to meals. Nevertheless we tend to sprinkle more salt on to the food to bring out the full flavour.

Under certain conditions, the necessity for adding salt to our diet becomes obvious if we taste our own perspiration on a hot day. The loss of salt from our body increases as we sweat more. This is why people involved in long periods of vigorous exercise e.g. athletes, or those who work in hot surroundings e.g. blastfurnacemen, have to take salt tablets, as otherwise they would tend to suffer from muscular cramp. In hot climates, salt is added to food for the same reason. Without any intake of salt, man would become ill very quickly and for this reason salt has held a powerful place in the economies of different civilisations throughout history. The Romans used to pay their soldiers in cubits (a measure) of salt, today this may seem an incredible way to pay people but at the time of the Roman Empire, salt was a difficult commodity to obtain. The Romans obtained salt in Britain by digging up huge areas of peat from the Norfolk Broads, the peat was burnt and the salt dissolved out. The Romans also collected salt from the North African coast, in this hot part of the world the shallow lagoons along the coast evaporate leaving huge amounts of salt deposits.

The salt from North Africa was not only important to the Romans, the people living south of the Sahara Desert also have a great need for salt. From about 600 AD onwards the Ghana Empire flourished just south of the Sahara Desert in West Africa. The people living in this hot dry part of the world have a great need for salt, and in return they could offer gold and ivory. This situation resulted in a great trans-Sahara trading route between West Africa and the salt deposits in North Africa. By the 12th century, the trade in gold had expanded to Southern Europe, and by medieval times the kings of England struck their coins in West African gold. As well as a food additive, salt has been used as a preservative for certain foods for centuries e.g. meat, fish, beans.

You can see that this topic cannot be treated with a pinch of salt! Everyone needs salt in their diet and around the world different people have found different ways of providing salt to meet their daily needs.

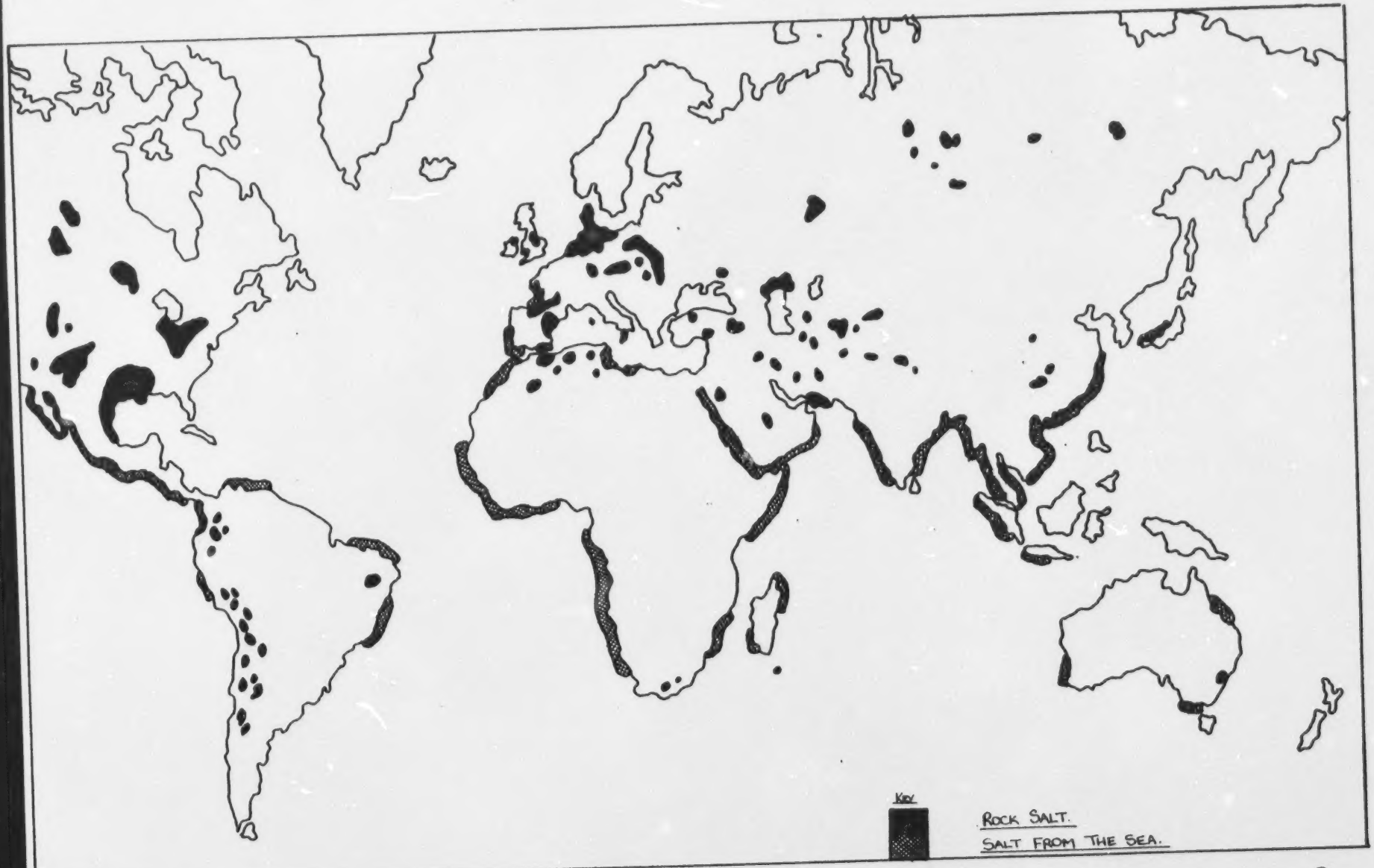


FIG. 1. SALT AROUND THE WORLD.

SALT MINES

In Britain today we are fortunate that deep below the ground we have deposits of common salt 60 feet thick. This is because 2,000 million years ago Britain was covered in a land-locked sea - the Triassic Sea, and as it slowly evaporated salt deposits were laid down. A similar thing is happening in the Dead Sea today. Using modern technology it is fairly easy to discover where these underground salt deposits are, but hundreds of years ago people had no way of knowing where they were unless a river valley cut deep into the land and revealed the layers of salt. (Read paragraph 1 again and try and find out how people in Britain might have obtained salt before discovering the salt mines).

Look at the map of the world (fig 1) and name three countries that could have salt mines and three countries that have no salt mines,

SALT FROM SEA WATER

Not every part of the world is fortunate enough to have salt mines but for countries that have a hot climate and a coast line common salt can be obtained from evaporating sea water. Out of the 60 million tons of common salt used by people every year, about 30 million tons are still extracted by holding sea water in shallow pools and allowing it to evaporate in the sun.

In this country there is not enough sunshine to provide the heat energy required to evaporate the sea water on a commercial scale.

With the help of a world atlas, look at the map in (fig 1) and name three countries that could not obtain salt from salt mines or by evaporating sea water.

Photograph 1 is a picture of a salt works near Dar er Salaam in Tanzania, East Africa. In the dry season sea water is allowed to flow into shallow coastal lagoons at high tide. In the hot, dry weather the water evaporates very quickly and as the sea water becomes more and more concentrated the salt slowly crystallizes out in the cool of the night. This salt can be scooped up and dried in the sun.

What do you see on the bank of the lagoon in the foreground of the picture? You could repeat this experiment in the laboratory by evaporating some sea water in an evaporating dish and allowing the salt to crystallize out. Why could it be dangerous to sprinkle salt made from sea water straight on to your dinner? How could you clean the salt up?

Coastal Salt Works near Dar-es-Salaam, Tanzania

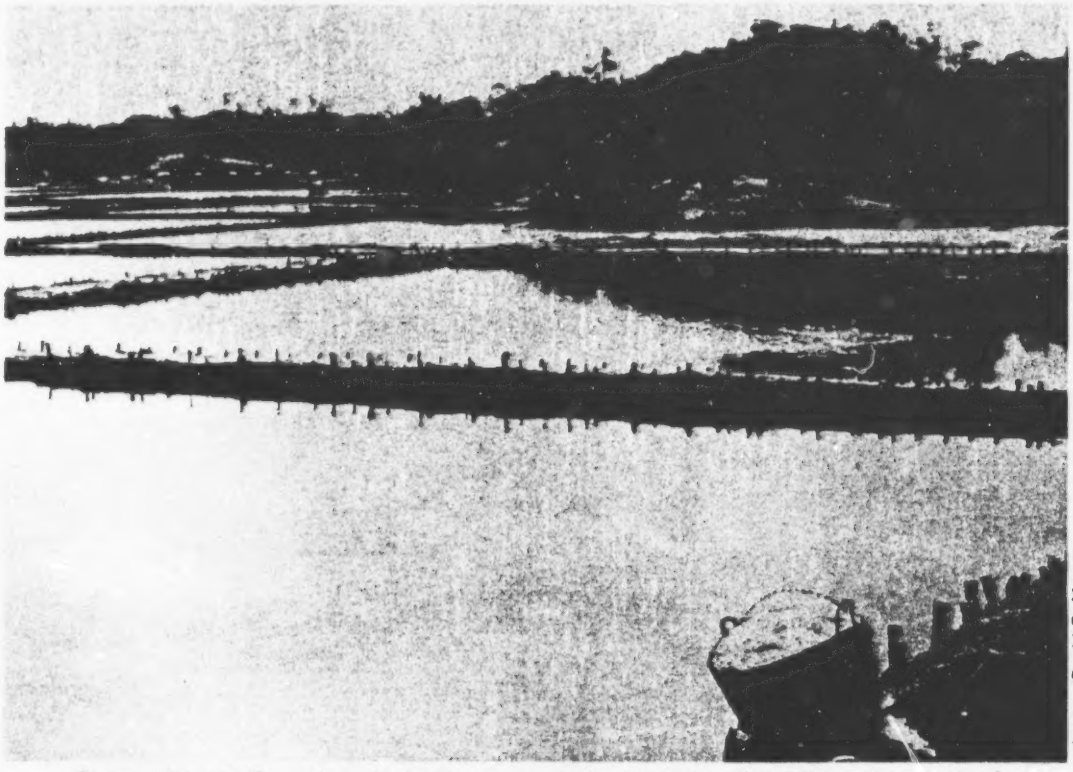
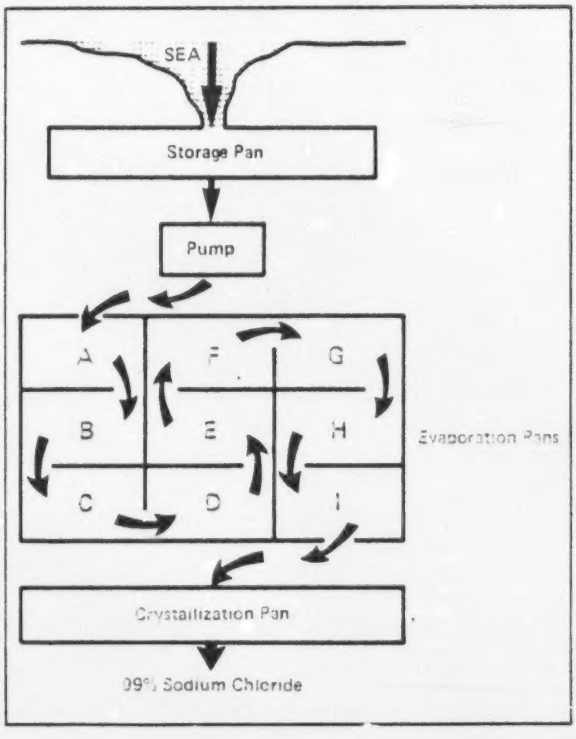


photo - David R. Morgan

Photo taken on Saturday afternoon at a coastal salt works a few kilometres south of Dar-es-Salaam at Mjimwema. Salt which has crystallized from sea water in shallow lagoons is gathered up by men into baskets woven from coconut leaves.



The diagram shows the salt works at Bagamoyo near Dar-es-Salaam. The storage pan is filled with sea water by the spring tide. From the storage pan the water is slowly pumped through the pans starting with A and going through to I. The water slowly evaporates leaving a stronger solution of salts in each pan. One of the salts in sea water, calcium sulphate, is not very soluble and crystalizes out into the evaporation pans. The sodium chloride is more soluble and stays dissolved.

By the last pan I, much of the water has evaporated and it is now pumped into the crystallization pan. With only a little more evaporation sodium chloride crystallizes into white cubic crystals. This salt can be removed by men with spades or by a machine. The salt produced is very pure sodium chloride because care has been taken to keep out other salts. The water left behind contains magnesium salts which are very soluble.

COMMON SUBSTANCES FOUND IN SEA WATER

Substance	Parts per 1000 (approx)	Solubility g anhydrous solute per litre of water at 20°C
Sodium chloride	27.2	360
Magnesiun chloride	3.8	544
Magnesium sulphate	1.7	330
Calcium sulphate	1.3	2.1
Potassium sulphate	0.9	111
Calcium carbonate	0.1	0.007
Magnesium bromide	0.08	1020

(Much smaller qualities of compounds containing boron, strontium, fluorine, and iodine are also found).

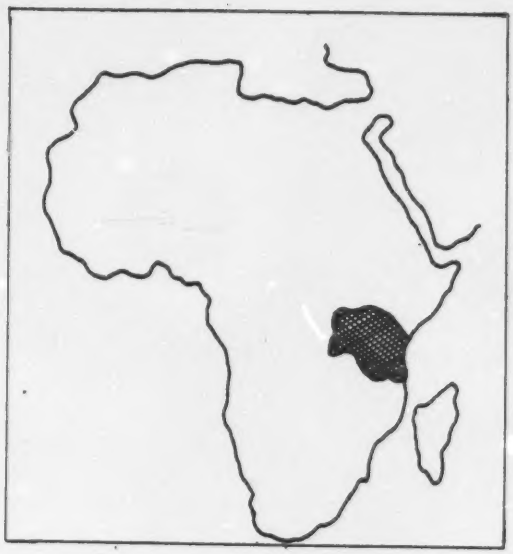
SALT FROM SWAMPS

Extract from an article by Mr. D.R. Morgan on Salt Production in Tanzania.

Salt has been a valuable commodity in East Africa since well before colonial times. At present salt is the second most valuable mineral product of Tanzania.

Often the salt from around the springs, lakes and swamps is found mixed with soil or mud. The method used to purify this salt was witnessed near Nala, which lies about 40 km. North-West of Dodoma in Central Tanzania.

Photographs 2 and 3 show pictures of a woman making salt. She belongs to the Gogo tribe in Tanzania, East Africa. In the dry season the swamps around her village dry up - leaving a mixture of salt and mud on the ground. This mixture is collected in gourds which are the fruits of the Calabash or Gourd tree. These hard shells make ideal containers for this purpose. For centuries the Gogo tribe have been using this salty soil as a source of making cooking salt, which is in fact a mixture of different kinds of salts.



AFRICA - SHOWING THE POSITION OF TANZANIA.

pH tests carried out on this particular Nala salt showed a value of between 7 and 8, indicating a very low soda content.

Photo:- David R. Morgan.

2. In the dried up swamp during the dry season, women and children gathered the salty soil which was placed in a gourd (C), at the bottom of which was a hole covered with fine needle-shaped leaves of a local tree. Water was allowed to filter through the gourd to dissolve the salt and was collected in gourd (D).

Photo:- David R. Morgan.

3. The salt solution was then evaporated in a open tray (E) over a wood fire. As the salt crystallized from the evaporating solution it was scooped out (F) and laid to dry in the sun. The salt was either used by the women themselves or sold in Dodoma market.

Answer these questions

a) Describe what the woman must be doing in Photograph 2.
In your explanation use the terms FILTRATION, DISSOLVE and SOLUTION.
Gourd (A) contains salty soil and gourd (B) contains water.
Think carefully what is happening in gourd (C) and (D).

b) Describe what is happening in Photograph 3.
In your description use the terms EVAPORATION and RECRYSTALLIZATION.

c) Looking at the two pictures, list the apparatus required to make salt.
What do you think the total cost will be for making this salt?

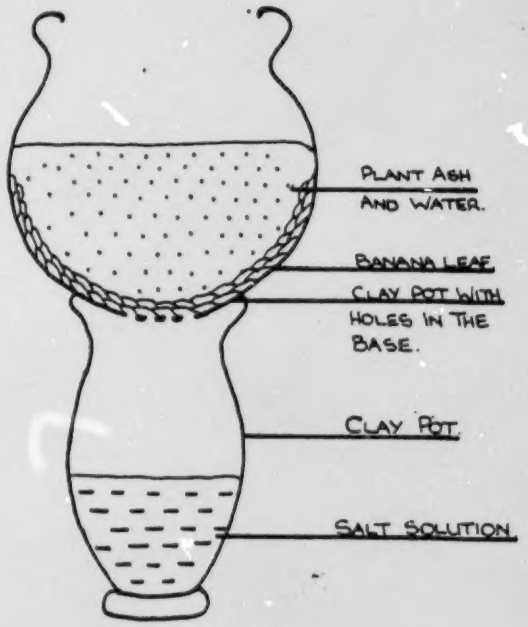
d) The Gogo people will buy this salt in the market in preference to pure common salt because they say it gives the food more flavour. Why might this be so?

SALT FROM PLANTS

All plants contain some salts. Salts are needed for plants to grow, this is why we put fertilizer on to the soil when growing crops. One of the oldest ways of getting salt for cooking is by extracting it from plants. This method is still used today in parts of Africa where there are no salt mines or where the coast is a long distance away.

Different plants for salt making are favoured by different tribes throughout Africa. Papyrus, certain grasses, banana leaves and banana skins are a few examples of the type of plant material used. Here is a description of how some tribes in East Africa produce salt from ashes:-

The dry leaves are burned on the ground and this produces a mixture of black ash and partly burned leaves. The salts are extracted using the method that is used in the laboratory to separate a mixture of sand and salt i.e. solution and filtration. The diagram shows how this is done in an African village.



A clay bowl with holes in the bottom is used, the holes are covered inside the bowl with strips of banana leaf. The leaf has slits cut in it, and this acts as a simple filter. The ash is put into the bowl and cold water is added. The water slowly soaks through the slits in the banana leaves into the pit below. More water is added when needed and the ash is pressed down from time to time. The solution of salt produced in this way is used immediately for cooking vegetables. Some people think that the cooking takes a shorter time with salts made from ashes than with salt (sodium chloride). Could this be so? Why do some mothers add bicarbonate of soda to cabbage when cooking?

Plant ash is not common salt (sodium chloride) but a mixture of salts. Papyrus has a high percentage of sodium chloride, up to 40% of all the salts present, also found are potassium chloride, sodium carbonate (soda) and potassium carbonate. In the north of Ghana, West Africa, people still prefer

to use plant ash salt, though common salt is readily available, because it neutralises the bitter taste of some vegetable soups, softens beans, and helps to preserve stews a little longer. Common salt is also added to give the food more flavour.

Making your own Plant Ash Salt.

You could try and copy this process in the laboratory using the apparatus available. Some plants will have more sodium chloride than others.

1. What would you use instead of banana leaf and clay pots?
2. Which plants would you decide to burn?
3. Would you expect salt marsh plants to give good results? Why?

CIBWA SALT

Now read the description of how Cibwa Salt is made in Northern Zambia. This was written by Michael Nasege and John Bwalya, two third form boys at Lubushi Seminary - a school in Northern Zambia. The work was presented as their Science project for the third year final Science examination.

From the information given which method would you use to make your own salt and why?

1. Make a list of things you need to know.
2. Describe what you would have to do if you had to make your own salt regularly.

PROJECT OF CIBWA

Cibwa Salt is mainly found in northern province of Zambia in Mpika District. This kind of salt is in a sort of grass as drawn below.

CIBWA GRASS - GREEN WHEN IT'S FRESH.

Just under the grass, things like (Samfwe) grow. When ever this grass is found, (mainly in plains) people clear away the useless grass away in a cleared place.

In August this grass is collected by using hoes and spread on the ground to dry. This grass may remain on the ground for about two months. When it is dry it turns brown in colour.

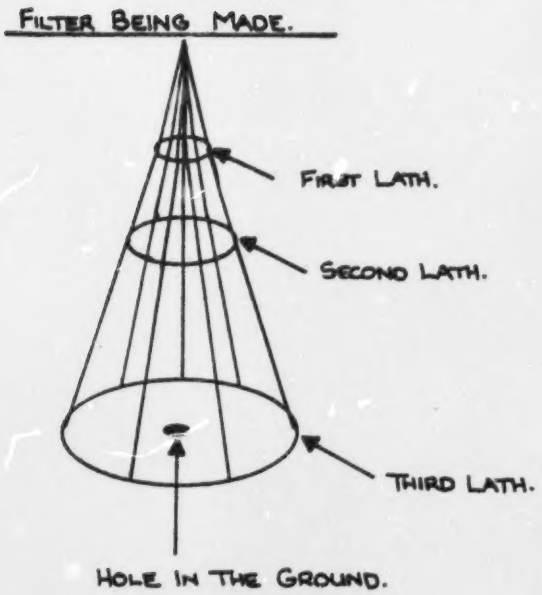
- BROWN WHEN IT'S DRY.

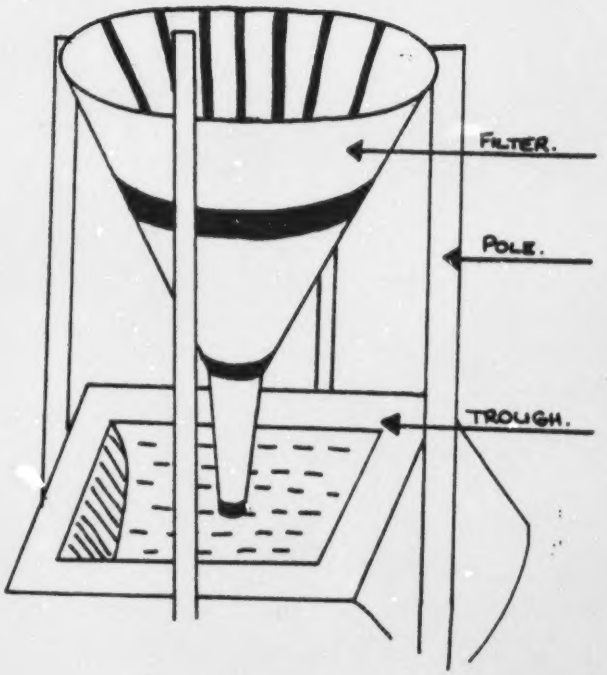
In September or October the process of making salt starts. The people first go and make shelters because this process spends more than two months.

Things needed for the people when going there are; clay pots, hoes, axes and many others. They also carry things such as impao that is mealie-meal and relish used when doing the extraction. With this kind of salt, no sacks are needed due to the fact that it is powdered, but also mats are not necessary as this kind of salt is dry and solid when produced.

Before anything is done we need four poles which are fixed into the ground. When these things are prepared, the fibres are needed. Then we look for grass to make a filter and find some small soft sticks which can help the filter to stand. To make the filter, we dig a hole in the ground which is about 15cm deep and fix it a pole of about 45cm long.

Around that pole we make a circle according to size of the filter. Around the circle we put small sticks which meet at the point on tip of the fixed pole in the middle of the circle. We tie these small sticks and then take laths and tie them at the end of the small sticks on top. One of these laths must be outside and the other one inside and between them we put grass which is taller than the height of the filter.





Also in the middle we put another lath and another which is to tie the lower part of the filter. After we have finished tying then we can get out filter, then we take this filter and hang it between four poles fixed in the ground. Just below the filter there is a trough which is also between these four poles and it is in this thing that the solution is collected. It is made from the tree trunk. Mainly these troughs are made from trees such as Musafwa, Kaimbi, Lupangalor, Somingo.

When a tree is cut down, we cut a piece of this tree which is of the medium size and of the length as we want. This piece of wood which we have cut is then turned into the trough by making a hole in the middle starting from the top but it shouldn't go through the wood. Tools needed for making this trough are an axe and imboso in the form of a small hoe.

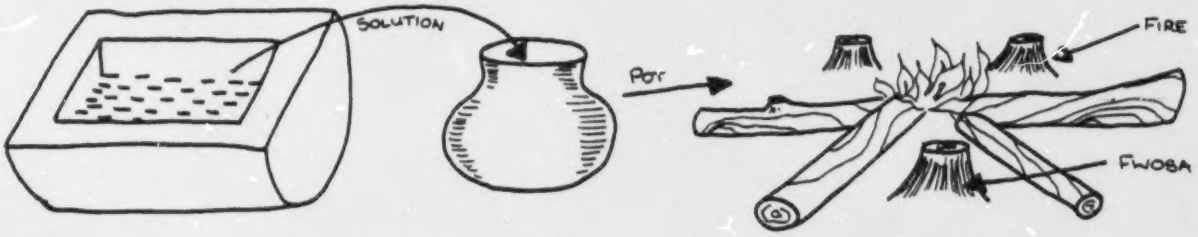
HOW SALT IS EXTRACTED

When we have got all the apparatus, the last thing is to make use of Cibwa grass. Cibwa Salt is extracted in August, September and October. People go to the place where they left their cibwa grass to dry and there they build shelters which are for temporary use. Two days later, they will start the burning of this dried grass so that they can get ash.

This ash is put in the filter and then water is added to the ash in the filter. This is a process of alteration which is to separate the insoluble impurities from the soluble impurities which is the solution in which our salt

is found. The solution collected given sour taste.

Then this solution is poured in clay pot. After putting this solution in the clay pot, fire is made.



After putting the solution in the pot and the making of fire, we then put this pot on fire so as to let the liquid evaporate and leave th lt behind in the pot. We must need a big fire to make the water eva .

To get the Salt after the evaporation of the liquid and after the cooling of the pot we just crush this pot gently and carefully so that we may get the salt which is not in a form of powder but in a solid state. This kind of salt is mainly called Icimondo. Icibindi and Cimbjsu Camucee.

Most Important Uses of this Salt

This kind of Salt is very important in the way that it helps us in the strengthening of bones, teeth and clotting of our blood.

There are also uses such as the putting in a relish and to the meat which is fresh to prevent it from getting rotten if we don't have fridge.

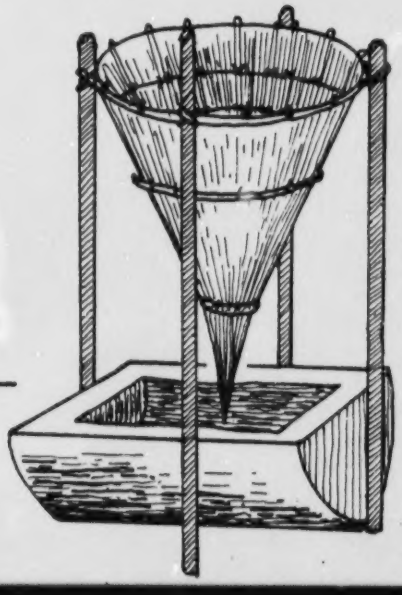
The grass of Cibwa grows mainly in sub soil in the plain.

BIBLIOGRAPHY

Imilimo Yabeno Kale written by Kosande
Motomofo Museum in Mbala
Mr. Patric Chisanga

PARTICIPANTS

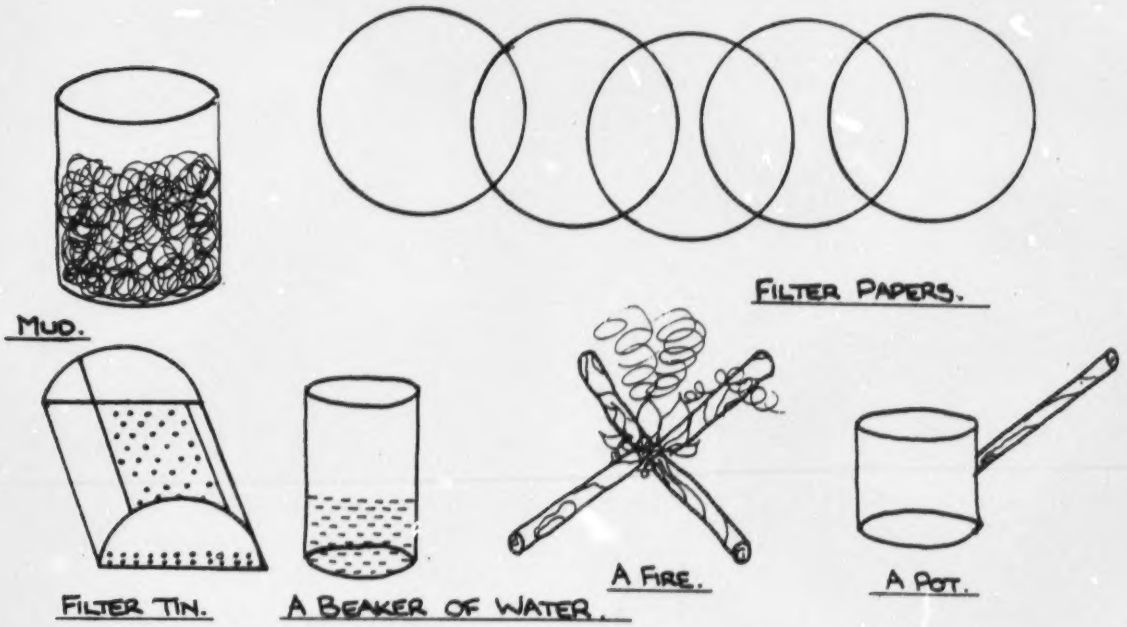
Michael C. Nasenge
John K. Bwalya



SALT FILTER.

MAKING SALT OUT OF A MIXTURE OF MUD AND SALT.

by Leonard Mwape and Mwila Clavel,
pupils from Lubushi Seminary, Northern Zambia.

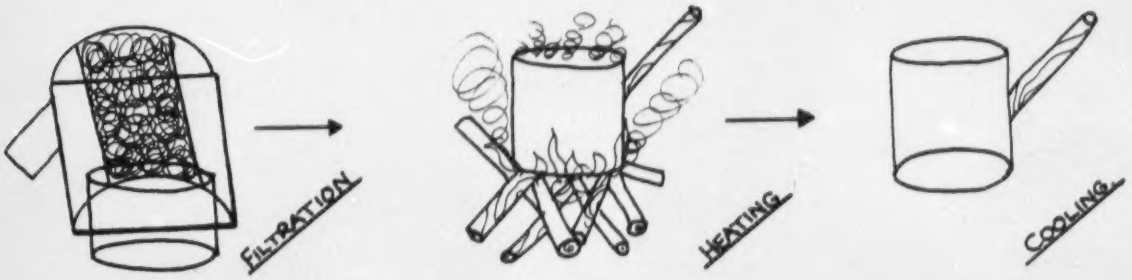


METHOD

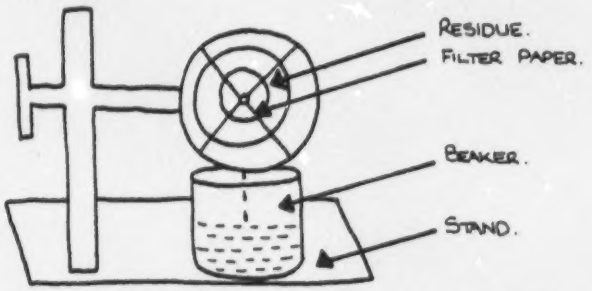
We took the mud, put it on a filter tin and under it was a pot. We put water on the mud and the water went freely through the mud carrying with it dissolved particles of mud. We continued to put water until the salt water was equal to the amount we needed.

After this process, we found out that the water was not completely pure, so we tried to put a cloth between the pot and the filter tin and we put grass in between the filter tin and the mud. By this method, the water became to be pure, took us 45 minutes.

We took the water and heated it. When it was on the fire we stirred it from time to time and when the liquid was thick like porridge we took the pot out of the fire, and after some minutes the liquid hardened up. The diagrams to illustrate these things are as follows:-



When we brought the salt to the master in charge he told us to dissolve the things again because it wasn't very pure. We dissolved it and after that, he gave us a stand, five filter papers and a beaker. After dissolving the salt we passed it through filter papers. On these papers, we noticed the residue which was left on the filter paper. We took one hour to do this second filtration and the diagram is illustrated as follows:-



We started again filtering. Five filter papers were all used. To show or know that there was salt in our water we took the glass put on water and left it on a window. It took half a week (4 days) for the water to evaporate and left really salt. Then we proved that salt is in our project. The rest of the water was put in a beaker. We don't know how much days it took for the water to evaporate.

CONCLUSION

If we have two different substances mixed together, we can look for a way in which we could separate them. If paraffin and water are mixed together, we can separate them by means of 'fractional distillation' because all of them have different boiling points. So it doesn't mean that we just took table salt and mixed it in with mud,no. This salt was mixed by God. The salt is recognised if on a certain place in the 'Ilungo' (a place where there's too much grass and is flooded during the rainy season) where there's no grass because the grass is being dried up by salt.

In old days salt was very important. Salt was used for exchanging things. If one has a tin of salt and the other has 1 metre of cloth they exchanged straight away. Also it was used to pay the trouble in a village e.g. if a boy kills a chicken, the mother of the murderer was supposed to pay salt instead. In old days also, salt was used to reward someone because there was no money so they used salt as a means of value.

BIBLIOGRAPHY

We got it from a book entitled 'Imilimoya Bena Kase' which was written by L. Kasonde.

PAPUA NEW GUINEA

Making Salt in the Highlands of Papua New Guinea

In different parts of the world people have developed their own methods of making salt. The source of salt is different. It may come from the sea, from muddy ground, or from grass as we have seen. The method of making it also differs from place to place and shows how people developed special skills to meet their own needs.

A teacher in a secondary school in Papua New Guinea asked his second form to find out how salt used to be made in that country, and to describe the methods for us.

Papua New Guinea is part of a large island, north of Australia. Ialibu High School is in the Southern Highlands, a long way from the sea. The school is a boarding school and pupils come from different districts.

Read some of the accounts, and then try to write down in your own words how salt is made in the Highlands of Papua New Guinea.

Remember:

1) Pupils come from different districts so there could be more than one method.
2) The pupils asked their parents and older people for information. How reliable do you think the information is likely to be?
3) The pupils have collected the information in their own language and translated it into English for us. They learn English in school. Can we understand their accounts?

How do the methods described differ from those you have heard about elsewhere? What did the people of Papua New Guinea use their salt for?

THE TRADITIONAL SALT

The traditional salt is a natural salt, which is called in the local language of Ialibu, 'Api'.

In the olden days before the coming of the white men the natural salt, 'Api' was essential to the people in many different ways. They used the natural salt for many purposes. It was used for Bride Price, special occasions, big feasts and for exchange some goods.

THE PROCESS OF MAKING TRADITIONAL SALT (API)

Many, many years ago, our ancestors invented the process to make natural salt. This is how it was made:

First the men who are specialised in making salt, searched for some special trees in the forest. They cut the trees down and split them into halves and quarters.

There is a small stream where natural salt is found. They make a small dam across the stream and make a small lake. All the men leaded all the timbers which they have cut, to the small lake and piled or stored them inside the salt lake. The men covered the woods with all sorts of timber and rubbish on top of the logs stored. It stays there for about three to four months. Later they take them out of the salt lake and dried the woods on the sun's heat.

While it is drying the men start to make fire and put the woods over the fire flame to burn. When all the woods are burnt the men gather the charcoals and ashes. They put the ashes together on the pandenut leaves and wrapped them and tied around really firmly, so that there won't be any air inside the parcels.

The men leave the parcels inside their houses for many periods of time. They take them out for special occasions, such as bride-price, big feasts, etc.

Thats all about the traditional salt. If you are really interested in, and to know more about traditional salt and some other things or stories of our beautiful country of Papua New Guinea, I'll be pleased to tell you more. You may write to me:

Iko Lama,
Ialibu High School.

HOW MY PEOPLE GET SALT

Long ago, before white men have come to the area, my local people who live around Pangia in the Southern part of the Highlands of Papua New Guinea use to get salt from the bush. This type is not pure salt as today, but it is just like water. It used to be found in the bush where the land is a bit low, but is used to be found near a river. This salty type of liquid rise from the ground. It used to bubble out like the boiling water. The colour of the liquid will be white. Whenever my people need it, they just go to that place and fetch it. The liquid is just similar to salt. We use it as salt in our food or sometimes boil the food with it. It is not used to preserve foods or meat etc., but it can be used when you are still eating. We don't taste it too much, because if you taste too much of modern salt, what happens? The same thing happens like the pure salt does. Whenever, if we want to keep it. We fetch the liquid on leaves or with small containers. Some of the people thought or said that this might be salt water (sea). The salty water has been discovered by the old people or our grandfathers. This people saw that the new type of liquid was just raising from the ground, so people began to taste it. They feel that it tastes different from the other water so, soon, people heard or saw it and tried it by themselves. It tastes so sweet that they tried it with food. As long as it was known people used it to exchange it for small goods that were produced in other villages. Nowadays my people don't use it too often, because they are using the pure salt at present. It is not being used by all people, but only few use it.

Written by KALE WAIT, PAUL YAUKA.

THE NATURAL SALT SPRING OF FINDUWA IN S.H.P. IALIBU

The salt spring is about five miles from the village and people have to go through thick bush to get to it. The salt spring spouts from rocky ground. It is only taken on sunny days or in the dry season. When it is a wet season the spring has no taste of salt. When people want to collect it they get their containers (especially bamboo) and collect as much as they can. Then when they bring it home they keep the containers filled with the salty water for two weeks or more to let a bit of the water dry and let the salt taste more. (It doesn't taste too salty). The liquid is a dark or gloomy colour.

Written by LUKE PUYE.

THE HISTORY OF HOW LOCAL SALT WAS MADE

This story was told to me by my grandfather who went to make salt in the Enga Province in the Highlands of Papua New Guinea.

There are rows of small ponds or lakes below the hills of Enga. First people cut soft trees and put them into salt water. Then they pull a special grass which will grow fully in a period of time. They cover the soft logs with the grass. Day after day they go and look at the special grass. When it grows to the size they want, the people take the logs out which they have put in the salt water. While it is still wet, the people burn them. While it is burning, the people will make small houses and sleep for the night. In the morning they wake and go over to the place and see what had happened to the logs. To their surprise, the people see solids of salt. My grandfather described it as a cement. There are two types of salt. One is black in colour and white is the other. The white one is called 'Lego' and the black is called 'Lago'. The sweetest one is called 'Lego' which is white in colour. Then they bundle them in banana leaves and bring them to their places or villages. The main name for the salt is called 'Abi'.

HOW PEOPLE FOUND OUT THE LAKE

One day a man from Enga went out to find his lost pig. Suddenly he came across a row of pools or lakes. He was frightened to touch the pool so he got a leaf from a tree and touched the lake and the leaf changed into a brown colour. He took the leaf to his house and left it at the door way, and went out to another house to talk to his friends about the rows of pools. While he was busy talking, his small son came home. When he saw that strange leaf he liked it very much. So he took the leaf, and chewed it and it was very sweet. So when his father came home and found the leaf, his son told him that it was very sweet so he ate the whole leaf up. After that people did many experiments and as an answer they came to the process which I have written about in the first place.

Written by PANDFA TONGE.

THE PROCESS OF MAKING SALT IN THE HIGHLANDS OF PAPUA NEW GUINEA

Firstly men cut down trees and collect rotten logs and we put them under the salt lake.. We put them under the salt lake and wait for some weeks. Later we take them out and put them aside. Then we build a small hut just near the lake for burning the logs. Inside the hut we made a squared hole lm wide and lm ddep. Inside the hole we filled them with logs and some dry leaves.

When we have put everything inside the hole we burn them up. The fire is going to burn it very quickly. Early next morning men goes along and sees that only the ashes are left inside the hole. Carefully we take the solid ash out and take all the dirt out. Then we take some leaves and wrapped them up and we put them in the house. We hang it up in the ceiling of the house for drying. When it is dried up we put it on the foods and eat. It tastes like modern salt. In the days of my ancestors this salt is very important to them. They used the salt for marrying a girl and it is worth more than K40.00. This is how salt is made in the Southern Highlands of Papua New Guinea.

Written by L. KAMAN KEPEA

TRADITIONAL SALT MAKING

In my village man goes through bush tracks to look for springs. Once when they find the spring they cut some special type of soft wood and put them on the spring and cover the spring and the soft wood with some flat bread fruit leaves. On some fine days they go to see the spring and when all the spring of salt is gone they take the wood and burn it to let the water from the wood to evaporate. And the water is evaporated and the salt and the timber is left so they chop the timber and put it on the ceiling of the house to let it dry and when it's dry they take the wood and squeeze it real hard with some village salt making instruments then they say some magic words and the whole thing turns snow white that it doesn't look like salt so they keep it in the ceiling for some special days to come, like pig killing, feast, singing days. When pigs are killed they take the salt out and eat it with pigs grease of dripping of the pig.

HOW THEY MAKE THE OLDEN TYPE OF SALT IN A OLDEN WAY, IT GOES LIKE THIS

When they want to make salt, first of all they go to the spring. The lake or spring must be like water. But it mustn't be like a big lake or spring. When they go then they cut down special dry wood and chop them into short pieces like log. After that they build a big fire above the spring of salt. When the fire burnt everything, the spring of the salt also dried. After drying the spring what is left behind is the ashes of the wood. The salt water is collected by the ashes of the wood, so they collect all the ashes and carried it home with the special kind of leaves tied around like a football. When they bring this home, they don't have to eat it straight away. They have to mix the ashes with water like cement first before they eat it. They have to break it into tiny pieces. When it is wet like cement, they have to take many, many flat leaves and tie it very strong like a round ball. And they smoke it above the fire and it becomes really solid like cement. They don't have to make round one all the time but they have to make a 20cm wide and 30cm long. The round one is called 'Linga' and the long flat one is called 'Langa' in our language. They use this olden salt for exchanging things like pigs, kina shells, and olden oil. For singsing. And it was one of the popular things in the olden days.

That's all about olden salt. I should not write but I asked my father. And he told me that I have made one in the border of S.H.G. and Enga Province. Behind Mt. Gluoe. He gave me all the information which is here.

THE PROCESS OF MAKING SALT IN OLDEN TIMES IN PAPUA NEW GUINEA

There are lake for a person in some parts of Papua New Guinea. When they found that there are lakes. The person cuts one sort of tree for the salt lake, and fill all the space with same sort of tree. After the person have done this he collect all sorts of rubbish and cover it up. Then they go into their house and when some months over time, the person goes and sees the place where he covered the rubbish. When he goes to the place he sees that the plants were growing so he just stayed some months again and the growing rubbish began to die. And when it was dead the man dig a hole on the other end and put dry wood. They do this and then he ties his hands with string bags and get the salt out of the lake and put it on the big hole and lit the fire. When it is put on the fire and fire heats the salt and the wood charcoal is gone inside the salt. After that we made big bundles and when it is feast time we use it.

Written by YANDA MOME

OLDEN WAYS OF MAKING SALT IN THE HIGHLANDS IN PAPUA NEW GUINEA

At first the men cut down trees, and collected rotten woods. After that they bundle them and sink them down in the lake where the salt was. And they collect wild pandanut leaves and cover the wood, and they cover the pandanut leaves with the ground. And they went home and stayed home for two to four months. After that they went and took out the ground and leaves. Then they took the woods out and burn them on the fire. They did not let the flame move out, but only the smoke was all over the place. When everything was burnt down, they found only the ash. And they fetch water and pour it on the ash. Then it becomes salt-solution, and they wrap it with some leaves and brought it home. I tested it one day and it tasted like salt. This salt was made in LAIGAM in the ENGA province in Papua New Guinea.

Written by MARK MAMBO

HOW TRADITIONAL SALT WAS MADE IN TAMBUL AREA OF W.H.P. P.N.G.

The salt was made from the same strong types of trees which is the special types for making salt. There was a special place for cooking salt. At first they used to cut some strong types of trees and they put them in the lake where they prepare to put those trees. In that lake they used to dig very deep drain for putting those trees in for making salt, then they fill the drain with those trees when they are ready to put in, after putting in the trees they cover the holes with rocks and grounds and they really cover up the drain very hard. After three months they took out those trees which they bury them and they have one small house which they build for putting in those salt trees to be burnt. When they took them out, they make very big fire in that small house and they start burning those trees. They make fire and when the fire starts burning they went to sleep. Early next morning they collect some special leaves for putting salt in and they went to the house where they cook those salt trees. When they saw the ashes there, they saw the solid states around the ashes and those are the salts which they collect them and put them in those leaves which they collect when they want to come to the small house. When they finish collecing these solid salts around the fire they wrap them with those leaves and they brought them out to some other villages to exchange them with some other things such as kina shells and with pigs. And they pass them around to other villages and to other places. This is how tumbuna salt was made.

Written by SMITH PORA I

HOW TRADITIONAL SALT IS MADE IN THE RURAL AREAS OF PAPUA NEW GUINEA

We have so many different ways of making salt in Papua New Guinea because we have so many different cultures, customs and languages. So that means other parts of Papua New Guinea may have different ways of making traditional salt. And this is how the people in my area make salt (the WIRUS) people who live in Pargion Sub-District.

This is how they make the traditional salt:

1. They go in the very big jungle and collect the materials or apparatus needed for making the salt. The name of apparatus:
   - i) 'Totango' - meaning salty leaf (special one)
   - ii) 'Tupinepo' - meaning special rope for tying the salt
   - iii) 'Lora' - special water which springs out from the ground which is very salty
   - iv) 'Yomo' - a special tree that people burn when they mix all these things up

   So you know that we use the above materials to produce the traditional salt.

2. After collecting they take them home from the jungle. And then they sink Yomo, the special tree into the swamp. After some weeks they take out and they make fire inside. When they see it is dried then they burn it. Before they burn this wood, the matches is not essential. The fire is started by causing friction, rubbing of a soft wood and one type of bush rope up and down to start fire. Anyway on making fire they burn everything they have collected from the jungle except the Lora (the spring salty water) which is put aside to pour while the materials are burning on the special wood. When these things are still burning they pour Lora on to the burning materials and mix all these things up - by crushing the solid parts of the ashes. Then it is taken to the special shelter and carefully dried on the hot fire.

3. As soon as they see that it was dried they take them to the main house where they live. So then the salt is ready for sale or exchange with other things or its obtained as Bride Prices.

There are lot more stories
But as far as I concern I have written, thank you.

Written by Rodney Kapi, (Grade 8 student) Ialibu Provincial High School,
P.O. Box 28 Ialibu, S.H.P. P.N.G.

Further Information

Translated Extracts From:

OLD CRAFTS - EMMANUEL KASONDE, MACMILLAN AND CO LIMITED, LONDON 1966

CHAPTER 2 SALT (1)

1. INUNGO AND IFISHIKISA

We know of four types of salt which are made by people in Zambia namely: Cibwa, Ifishikisa, Inungo and Umucele-wa-nseke.

Some people might not agree to the classification of Inungo and Ifishikisa as salt but that would be wrong. Inungo and Ifishikisa are not very different. The only major difference is the Inungo is the substance that remains after boiling Ifishikisa, where Ifishikisa is in liquid form. The other difference is in their utility. Inungo can replace Ifishikisa and not vice versa. This is because Inungo is stronger than Ifishikisa. In addition Ifishikisa can be got from all the trees used in making Inungo but not all Ifishikisa producing trees can produce Inungo. Moreover Inungo can be stored for a long time without going bad, unlike Ufishikisa. This made Inungo more preferable to Ifishikisa for our ancestors.

Some of the trees from which Ifishikisa is made are: Cassava and Groundnut stems, tobacco roots, Namatongwe, Umuputu, Citapatapa, Impalipali, Sha Cifume, Ne Sha Muspompa, Ne Sha Muputu, Umusungu from both the inland and along the shore, Iminungwe and a lot more. Some of the above trees can also be used in making Inungo.

Ifishikisa and Inungo are made from different trees in different places depending on the type of tree available. In my view Ifishikisa could have been the first type of salt to be used by our ancestors. This is because it is made from ash. It could also be that stone salt was first made from Ifishikisa. We cannot be sure since we have no written records. The other thing is that not all trees that we have mentioned were discovered by our ancestors, some have been discovered by our own generation.

In making Ifishikisa they burn the trees we have mentioned above to ash. They put ashes on a sieve and they slowly add on water with the mixture dropping into a container. If they want to make Inungo, they will boil Ifishikisa and collect the remians in the pot. The other name for Inungo is 'Inambwa'. Ifishikisa is used as salt in relish like some types of fish, cassava leaves, mushrooms, etc. Inungo is added to tobacco, weak beer,

2. STONE SALT

Another old craft is that of making stone salt. Due to the lack of records we don't know when and who started making this type. This type of salt here is made near Lake Mweru, and it is in two types. One type is brighter than the other and more saltish in taste. The names are also different. One type of salt made in Tabwa near Lake Mweru is called 'Kayenge' and the other 'Puta'.

Additional Information Reference to Translation

The various types are all or principally SODIUM CHLORIDE. Although small amounts of other salts e.g. POTASSIUM CARBONATES, etc. may be present.

They change their names according to their particular state. The Cibwa is the same as Umucele Wanseke (stone salt).

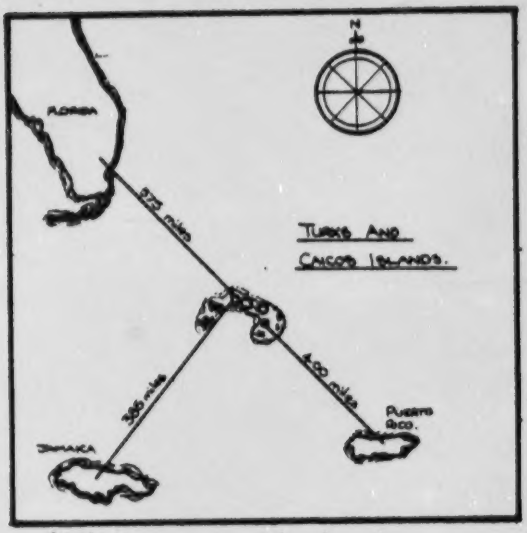
Ifishikisa is NaCl in solution and Inungo is the residue of evaporated Ifishikisa.

Inungo is said to have 'most strength' and keeps for a very long time and safely.

Ifishikisa (salt solution) would be inconvenient to store - and if left in an open container - would soon collect foreign material.

Inungo, salt in the dry state would be easier to store in sacks etc.

TURKS AND CAICOS
ISLANDS



Men of British stock, from Bermuda, realised in the 17th century that some of the islands were ideal for the commercial production of salt. Every year, in the hot months between March and October, the Bermudians would sail 900 miles south to the Turks and Caicos. They cut down the trees, divided the lagoons with walls and sluices, allowed sea water to evaporate, then raked up great mountains of salt for lucrative export to England and America.

In the 19th century, when the design for a Turks and Caicos flag was sent to London for authorisation, the salt factor caused a rather wonderful blunder. The design was for a Union Jack enblazoned with a shield showing heaps of salt in front of a three-matered ship. The London flagmaker, as ignorant as we are today, assumed the heaps of salt were igloos denoting some Artic colony, and obligingly added a touch of his own, a doorway in one of the heaps of salt. The flag duly became official, and remained the colony's standard until recently.

Contribution by Ygerne Wilson, 3rd year pupil of Grand Turk High School, Turks and Caicos Islands, British West Indies.

Salt Production by Solar Evaporation

In order to give a clear understanding to the process of salt production I will quote section of a report published by the United Nations Industrial Development organisation in Vienna published in 1968.

Solar-Salt Process

Saline Water from the sea or elsewhere is pumped into a system of shallow concentrating ponds which are interconnected by channels and arranged so that the saline water can flow by gravity, or pumping as required, from one pond to another in a designed sequence. Here the brine is exposed to the evaporating action of sun and wind, and its salt concentration rises from an initial 3 degrees by Baumé Hydrometer to 22 and 24 degrees in the final concentrating pond.

An important factor is the control of the water flow through successive ponds to raise the salt concentration in stages to about 14-25 degrees Baumé. Calcium sulphate crystallizes and settles to the bottom of the pond. The brine mother liquor is then allowed to flow into ponds specially prepared for the crystallization of salt (sodium chloride). These basins are smaller than the ponds and have flat, well-prepared bottoms, so that the crystallized salt can settle in a uniform layer at the bottom. The concentration mother liquor above the salt, called *bittern*, is then run off at 28-29 degrees Baumé - and has a large concentration of magnesium salts, either to waste or to a system of recovery of the chemicals.

The remaining salt - basically 97-99% sodium chloride is then harvested by a variety of processes ranging from simple hand labour - which is the system in Salt Clay - to highly mechanised equipment that scrapes up the salt and automatically transfers it into conveyors for washing, storage and eventual transport. In some operations, where there is a refinery, the salt is refined, packaged in a variety of forms from bulk to table packets and prepared for shipment.

Requirements for Solar-Salt Operation

1. Availability of water of sufficient salinity
2. Suitable weather conditions - where there are long periods without rain and with a hot dry wind to help evaporation. Measurements must include temperature. rainfall, humidity, wind velocity and effective evaporation

rate. In the Turks Islands the period for salt production is from April to October depending on weather conditions.

3. Suitable site conditions in a large area of flat land, close to the source of saline water, accessible to deep water for sea loading of bulk salt and in large countries - railway near to existing railroads or highways and public utilities.

Effect on the Economy

It should be borne in mind that in addition to providing a country's requirements for salt - for such uses as food seasoning, hide and skin treatment, and fish preservation - the output of a solar salt plant has the potential of providing a developing country with a source of raw materials (should it at a later stage need to establish a basic chemical industry producing e.g. soda ash, caustic soda, and chlorine - all of which require salt).

Solar Salt Production

This requires the constant availability of sea water of a suitably high salinity, and where the action of tides to obtain water is usually practicable as is the custom in the Turks Islands. The use of a canal connected to the sea is necessary and a pumping station is situated at the outer point of the pipeline projecting into the sea. One U.S. gallon of sea water contains approximately 0.203 lbs of recoverable salt, therefore the quantity of sea water to be pumped into the salina depends on the production programme.

Crystallizing Ponds

These may be operated in a number of ways. A typical method is to run in 7 -10 cms of concentrated brines and allow it to concentrate to the desired extent while depositing salt.

Density measurements are important to control this stage of the process. The mother liquid or *bittern* is run off when the density has reached 28-29 degrees Baumé. A fresh supply of concentrated brine is then admitted at about 25½ degrees to maintain the desired range of density. The process is repeated until a cake of salt 14 -20 cms (6"-8") is built up. This is then harvested.

Harvesting of Salt

This involves collecting the salt from the crystalizing ponds, using a wide range of techniques. At one end of the scale hand labour is used to

remove the salt with picks and shovels, placed into small piles and prepared for shipping in whatever process is required (systems used in Turks Islands). Although the work is hard and unpleasant, it provides a source of employment. In Grand Inagua the harvesting operation is fully mechanized.

Handling of Salt

In some cases the salt is crushed into a fishery grade for fish-curing and shipped in bulk - usually to the Canadian markets. It is also shipped to American markets for chemical purposes. For export sales of salt, it is desirable to have good port facilities - with deep water channel. The use of barges or lighters in the Turks Islands entails much double handling and with a low cost product like salt adds appreciably to the cost and slows the loading rate.

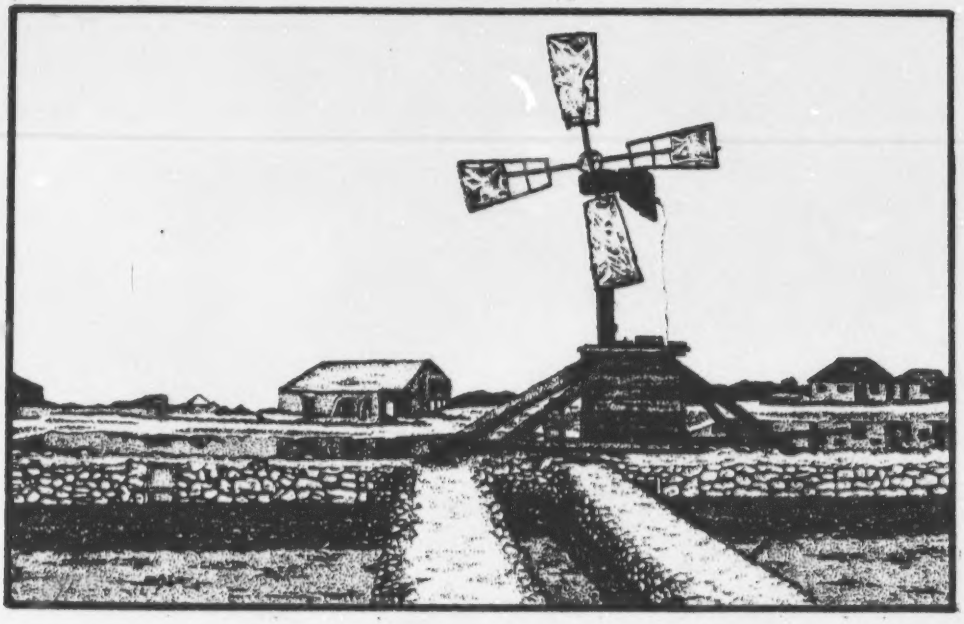
If operated on a very large scale with scientific and mechanical control - it can be the source of a number of products other than salt, in addition to the *gypsum* or *calcium sulphate*, which is the first precipitate of sea water. *Magnesium chloride* can also be recovered from the *bittern* after 30 degrees Baumé. Salt is required for *caustic soda and soda ash* which are basic raw materials for a variety of products e.g. rayon, soap, glass and chlorine.

Production in the Turks Islands

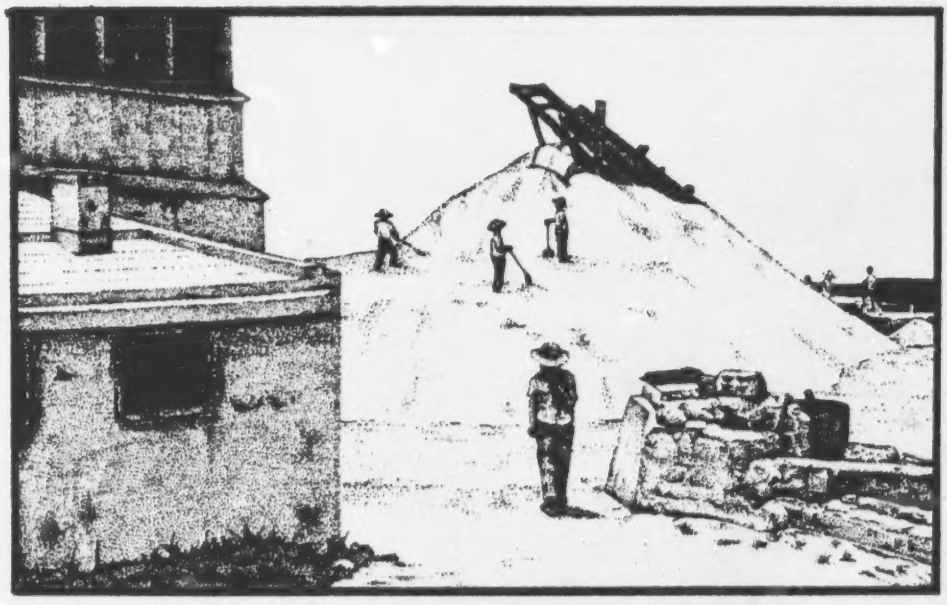
The proportion of the crystallizing ponds to the concentration ponds should be 1 to 15, in order to allow a large area for concentration and deposit of foreign matters and calcium sulphate. The density of sea water is 3½ degrees Baumé. This is admitted by gravity into a large reservoir - first of the concentration area, where the first impurities are deposited. It is then pumped by windmills into primary reservoirs at about 12½ degrees Baumé. Where it feeds by gravity into secondary reservoirs at about 20 degrees, which in turn feeds into the final concentrating reservoirs where the remaining calcium sulphate is deposited.

At about 25½ degrees it is pumped into crystallizing ponds by windmills - where the salt is crystallized. The same procedure is followed as described in previous paragraph on concentration.

SALT PRODUCTION IN THE TURKS AND CAICOS ISLANDS.



Ancient windmill still pumps brine at Salt Cay.



Mountain of unprocessed salt ready for shipment at Salt Cay.

SOLAR PRODUCING COUNTRIES OF THE WORLD

from United Nations Report 1968

United States
Bahamas — Large solar salt production - not recorded
Aruba, Dutch West Indies
Anguilla

Algeria	120,000	tons	per	annum
Argentina	853,000	"	"	"
Brazil	1,000,000	"	"	"
Bulgaria	60,000	"	"	"
Chile	443,000	"	"	"
China (Taiwan)	500,000	"	"	"
Cuba	150,000	"	"	"
Haiti (Poor Quality) - not exported	70,000	"	"	"
Malta	2,000	"	"	"
Nicaragua	18,924	"	"	"
Peru	70,000	"	"	"
Sudan	60,000	"	"	"
Turkey — not recorded				
U.S.S.R.				
Africa (North)	1,048,000	"	"	"
Africa (West)	90,000	"	"	"

*BAUMÉ SCALE

A special hydrometer scale in industrial use, really two scales one for liquids lighter than water and another for liquids heavier than water. The former is used in the petroleum industry and the latter in the acid and heavy chemical industry.

FOR LIQUIDS LIGHTER THAN WATER	DEGREES BAUMÉ	FOR LIQUIDS HEAVIER THAN WATER
.....	0	1.000
0.000	10	1.074
0.933	20	1.160
0.875	30	1.261
0.823	40	1.381
0.778	50	1.526
0.737	60	1.706
0.700	70	1.933
0.669	80	2.231

Reference: Van Nostrand's Scientific Encyclopedia

au cœur des marais salants

à Saillé...

LES PALUDIERS VOUS INVITENT A VISITER

LA MAISON DES PALUDIERS

LE PAYS PALUDIER :

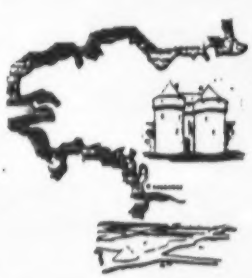
- ▶ MAQUETTE DE MARAIS SALANTS
- ▶ OUTILS TRADITIONNELS
- ▶ LES MARAIS, HIER ET AUJOURD'HUI

LES PALUDIERS :

- ▶ COSTUMES, COIFFES ET MEUBLES TRADITIONNELS
- ▶ L'HISTOIRE
- ▶ LES COUTUMES

MONTAGE AUDIO-VISUEL : le travail du marais, de l'habillage à la récolte

JUIN - SEPTEMBRE	JUILLET - AOUT
14 h - 18 h	10 h - 12 h 14 h - 19 h



l'ARMORICAIN

SEL marin breton de la presqu'île guérandaise

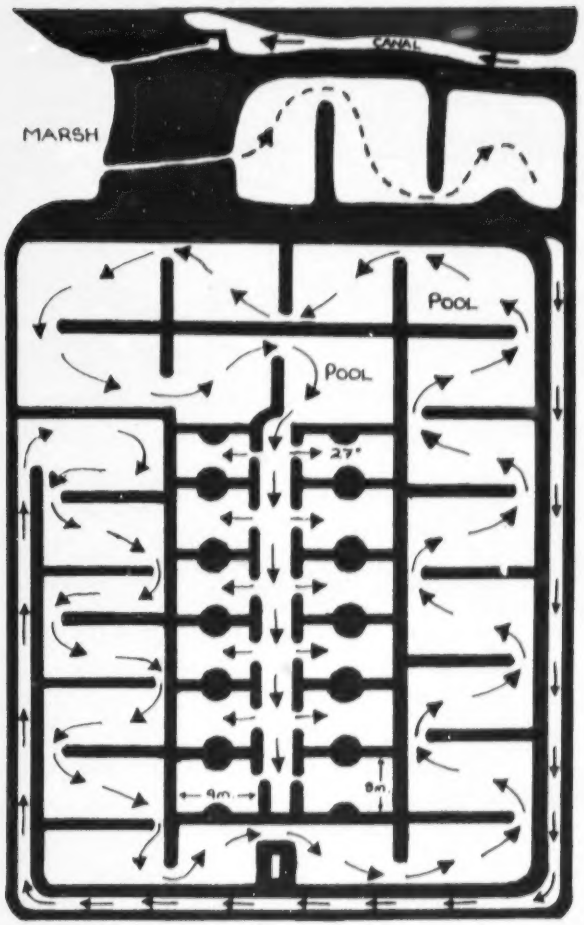
C'EST UN PRODUIT GARANTI NATUREL par le Groupement des Producteurs de Sel

SIÈGE SOCIAL : MAIRIE DE GUÉRANDE
SECRÉTAIRE : Mme MONFORT Michèle - tél 23.91.70

un grain de SEL guérandais... c'est autre chose

THE COLLECTING OF BRETON SEA-SALT NEAR GUERANDE

PLAN OF A SALT WORKS.



The water is stored in collecting reservoirs-marsh - for 15 to 30 days, about each high tide.

After channelling it into small pools; evaporation pans; the concentration is about 10 to 11° Baumé, the water evaporates to leave calcium carbonate and iron oxide deposits.

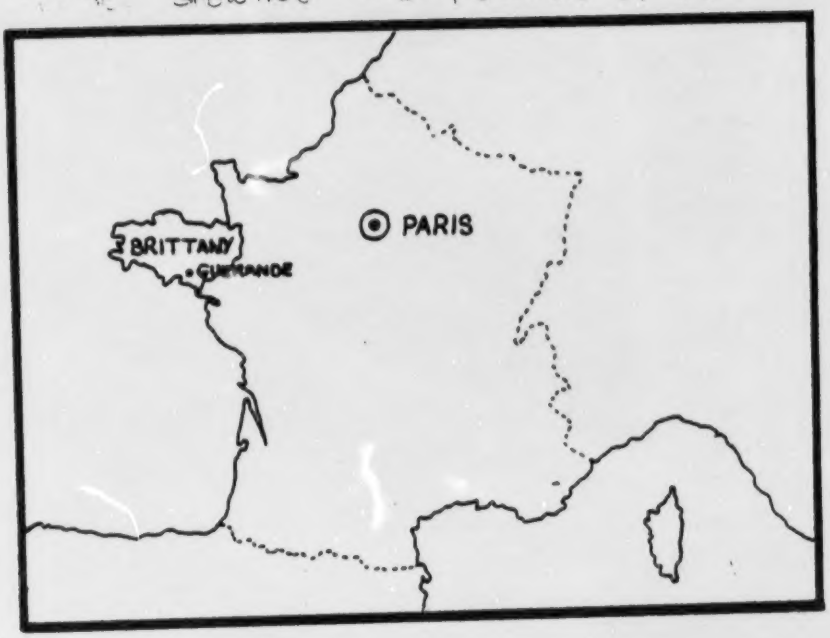
This process continues from pan to pan, and the concentration increases from 11 to 25° Baumé and during this calcium sulphete is deposited.

Once the sea water reaches 27 to 28° Baumé the final stage takes place in the crystallising pan where the salt crystallises out by night fall. The Guerandais salt is then collected by the salt maker. During the whole collection, depending on suitable weather, each crystallising pan will supply 50 kg of salt per day (in July and August).

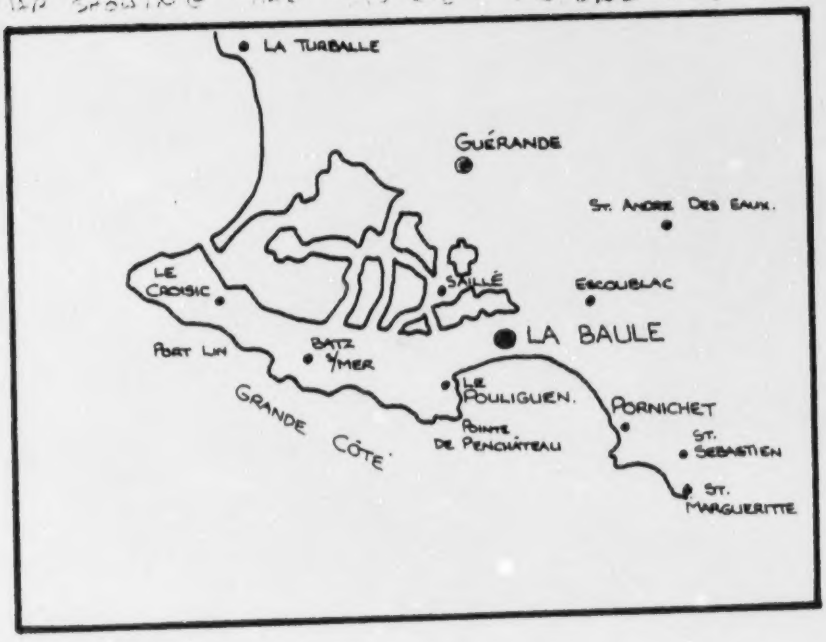
Each salt maker will work about 60 to 80 pans. All the collecting is done during the summer and major maintenance is done on the salt pools in Autumn and Winter. The salt is a product of the wind and sun.

4.

MAP OF FRANCE SHOWING THE POSITION OF BRITTANY



MAP SHOWING THE DISTRICT AROUND GUERANDE



References and Acknowledgments

1. Education in Chemistry. Jan. 1971. Vol.8; No.1.
'Salt Production is Tanzania'.

2. Chemistry Readers for East Africa.
'Salt in East Africa' by R.T. Allsop.

3. Nuffield Chemistry Background Books.
'Chemicals and where they come from'
Ed. H.P.H Oliver, Author R.T. Allsop.
Longmans/Penguin Books 1966.

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